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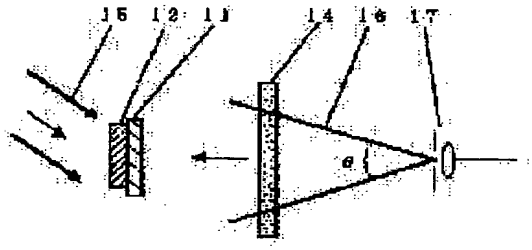
(54) METHOD OF ADJUSTING ANGLE OF VISIBILITY OF HOLOGRAM

(57)Abstract:
PROBLEM TO BE SOLVED: To maintain a desired angle of visibility to see a pattern recorded in a hologram by using at least one optical diffusing sheet having specified roughness corresponding to the specified angle of visibility after the production of the hologram so as to control the angle of visibility of the hologram in the production of the hologram.
SOLUTION: A hologram photosensitive material 12 is adhered to a transparent substrate glass 11. The hologram photosensitive material 12 is irradiated with second laser light 16 having a controlled diffusion state from the transparent substrate glass 11 side through a light diffusing glass 14 as a light diffusing plate, while first laser light 15 is made to irradiate in the same plane as for the second laser light 16 through the rear side to the irradiation side of the second laser light to produce a hologram. The second laser light 16 is transformed into spherical diverging light at a diverging angle θ by a spatial filter 17 and transmits through the light diffusing glass 14. The light diffusing glass 14 is controlled to have specified surface roughness so that it gives proper diffusion to the light with diverging angle θ and to allow the laser light to enter the hologram photosensitive material 12.



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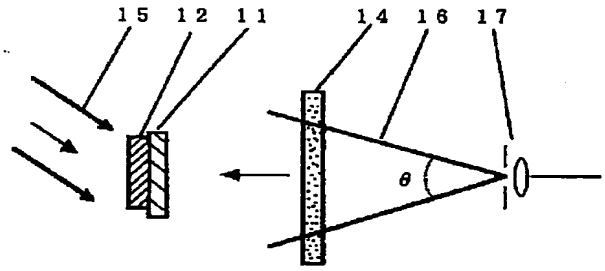
(54)【発明の名称】　ホログラムの視野角調整方法

(57)【要約】
【課題】ホログラムに記録されたパターンの見える角度範囲を予め設定することのできるホログラムの視野角調整方法を提供する。
【解決手段】ホログラム作製後の所定の視野角に対応している所定粗さの少なくとも１枚の光学拡散板１４を使用して、ホログラム感光材料１２に露光し、このホログラム作製時にホログラムの視野角調整を行う。



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【特許請求の範囲】

【請求項１】ホログラムの再生像の視認可能な角度を設定するホログラムの視野角調整方法であって、可干渉性の光をホログラム感光材料に照射し、ホログラム作製後の所定の視野角に対応している所定粗さの少なくとも１枚の光学拡散板により前記可干渉性の光を拡散光としてホログラム感光材料に照射し、所定の視野角を設定することを特徴とするホログラムの視野角調整方法。

【請求項２】前記光学拡散板の表面粗さを４μｍ～６０μｍとして、対応する視野角を３０～１００°に設定する請求項１に記載のホログラムの視野角調整方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、ホログラムの視野角調整方法に関し、特には、ホログラムのパターンの視認可能な角度の広さを求められるエンブレム等に用いるホログラムの視野角調整方法に関するものである。

【０００２】

【従来の技術】近年、車両用オーナメントにホログラムを用いることが提案されている。このような場合に、ホログラムは、所定の方向から入射した光が回折し、観察者にこの回折光を視認させる。そして、ホログラムに予めパターン等を記録しておくことで、観察者はこのパターンを認識する。車外からの光（例えば、太陽光や他車からのライト）を回折するホログラムを作製することで、これらの光の具合によって、斬新な像を観察者に視認させることができる。車両用窓ガラスの装飾として、窓ガラスに貼り付けた場合には、車外や車内からの光で、任意にデザインされたパターンが記録されたホログラムによって車外側からパターンが見えるような装飾ができる。

【０００３】

【発明が解決しようとする課題】ここで、ホログラムは、作製時の条件に依存して波長選択性を有しており、特定波長域の光のみを回折し、その他の波長の光はホログラムを透過してしまう。そのため、ある方向から入射する外光に対して、回折される光の方向が一意的に決まってしまい、狭い角度範囲の回折光となる。その結果、上記のように、ホログラムを車両用オーナメントのパターンに用いる場合、車外の観察者がこのパターンを視認できる角度領域（視野角）が限られてしまい、パターンが視認されるのは特定の方向のみとなるという問題がある。そこで、ホログラムに記録されたパターンの見える範囲を広げるには、見える方向の異なるホログラムを複数枚重ねて積層するという構成が提案されているが、積層工程の重複、層厚の増加による異物感、可視光透過率の低下、コストアップなどの問題を有している。

【０００４】本発明の目的は、前述の課題を解決することであり、ホログラムに記録されたパターンの見える角度範囲を予め設定することのできるホログラムの視野角調整方法を提供することである。

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【０００５】

【課題を解決するための手段】本発明は前述の課題を解決すべくなされたものであり、ホログラムの再生像の視認可能な角度を設定するホログラムの視野角調整方法であって、可干渉性の光をホログラム感光材料に照射し、ホログラム作製後の所定の視野角に対応している所定粗さの少なくとも１枚の光学拡散板により前記可干渉性の光を拡散光としてホログラム感光材料に照射し、所定の視野角を設定することを特徴とするホログラムの視野角調整方法を提供する。上記光学拡散板の表面粗さを４μｍ～６０μｍとして、対応する視野角を３０～１００°に設定する上記のホログラムの視野角調整方法を提供する。

【０００６】

【発明の実施の形態】以下、実施の形態について説明する。図１は本発明に関わる実施の形態のホログラムの視野角調整方法によるホログラム作製法を示す概略図である。透明基板ガラス１１上にホログラム感光材料１２が貼り付けられている。ホログラム感光材料１２に対して、透明基板ガラス１１面側から光拡散板としての光拡散性ガラス１４を透過して拡散状態が調整された第２レーザ光１６を照射し、この照射側の裏面側から第２レーザ光１６と同一面内の第１レーザ光１５を入射させ、ホログラムを作製する。

【０００７】ここで、第２レーザ光１６はスペーシャルフィルタ１７により発散角度θで球面発散光に変換される。そして、光拡散性ガラス１４を透過する。この光拡散性ガラス１４は表面粗さが所定の数値に設定されており、スペーシャルフィルタ１７による発散角度θに対して適度な散乱を与え、レーザをホログラム感光材料１２へ入射させている。この光拡散性ガラスは一枚でも十分な効力を発揮するが、複数枚使用することもできる。その場合、表面粗さをそれぞれに変更することもできる。なお、透明基板ガラス１１には、乱反射を防止するコーティング層を設けてもよい。

【０００８】図２は、図１により作製されたホログラムの回折状態を示す概略図である。この図のように、図１の光学系により作製されたホログラム２２へ、外光２５が図１のレーザー光１５と同じ方向から照射されると、回折光２６が回折発散角度θ_1だけ拡散して再生される。この回折発散角度θ_1が視野角と等価である。そして、この回折発散角度θ_1は、図１に関する記載のように、ホログラム作製時の光拡散性ガラス１４の使用により、発散角度θを大きくすることで結果的に大きくなる。つまり視野角が拡がる。そこで、図１に示したホログラム作製工程において、光拡散性ガラス１４に所定の粗さを与え、これによって対応する散乱を第２レーザ光１６に与え、この所定粗さに対応した所定の視野角をホログラムに与えることができる。

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【０００９】この光拡散ガラスとして、研磨材で表面を研磨したガラスを用いる場合、研磨材の粒径を適度に粗くすることにより、発散角度θが大きくなり、視野角が拡がる。または、所定の研磨材粒径による研磨により、対応する所定の視野角を得ることもできる。この場合、表面粗さの所定の数値の決定要因として、研磨材の粒径があり、具体的数値としては、４μｍ～６０μｍが好適で、好ましくは、１０μｍ～４０μｍである。粒径を４μｍ～６０μｍとすると、対応する視野角は３０°以下となる。ここで、粒径が４μｍ以下の場合、鏡面仕上げになり拡散性が得られず、光がほとんど透過することとなって不適当で、６０μｍ以上の場合、光拡散ガラス表面の粗さが大きいため拡散性が低下し不均一となり、やはり不適当となる。

【００１０】次に、図３は、図１により作製されたホログラムの実際の使用形態を示した概略図である。図１に示したホログラム作製工程で作製したホログラムを車両の窓ガラス４１の車内側にアクリル系粘着層４４を介して貼り付け、ホログラム４２のもう一方の面にはアクリル系粘着層３５を介してハードコート処理されたポリエチレンテレフタレート（ＰＥＴ）による保護層３３を積層した。

【００１１】この構成としては粘着層または接着層／ホログラム／接着層／保護層であるが、そのほかに、粘着層または接着層／ホログラム／保護層、さらには、ホログラム／保護層でもよい。また、図４は、図１により作製されたホログラムの実際の他の使用形態を示した概略図である。この図に示すように積層方向によって窓ガラス４１の車外側に貼り付けることもできる。この場合、ホログラム４２はアクリル系粘着層４４を介して貼り付けられ、このホログラム４２のもう一方の面にはアクリル系粘着層４５を介してハードコート処理されたポリエチレンテレフタレート（ＰＥＴ）による保護層４３を積層した。ホログラムは厚さ２０μｍ、縦８０ｍｍ、横１２０ｍｍのアクリル系フォトポリマーからなるリップマンタイプの体積・位相型の反射型ホログラムである。

【００１２】ここで、太陽光線の紫外線成分からの保護の点に鑑みて、窓ガラスの車内面に積層する場合はガラスに貼るための粘着層または接着層に紫外線吸収成分を混入することが望ましい。紫外線吸収性能としては単板ガラス部位での保護の点からフロントガラスに用いられる合わせガラスに近いほど良く、３８０ｎｍ付近で５０％以下にカットされていると効果があるが２０％以下が好ましい。さらに、外的要因からの保護の点に鑑みて設けられる保護層については、保護層とホログラムの間に粘着層または接着層を介してもよい。ホログラムを窓ガラスの車外面に積層する場合、太陽光線の紫外線成分からの保護の点に鑑みて、保護層または保護層とホログラムの間の粘着層または接着層に紫外線吸収成分を混入することが望ましい。

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【００１３】（実施例１）以下、図１に示したホログラム作製工程で作製したホログラムの実施例を説明する。透明基板ガラス１１上にホログラム感光材料１２が貼り付けられている。第２レーザ光１６は透明基板ガラス１１からの距離３００ｍｍの位置に設置した光拡散性ガラス１４を透過して拡散状態が調整される。そして、この拡散状態が調整された第２レーザ光１６は透明基板ガラス１１側から基板の法線に対して１０°の角度で、ホログラム感光材料１２を照射する。この照射側の裏面側から第２レーザ光１６と同一面内で法線に対して５０°の方向からホログラム感光材料１２へ第１レーザ光１５を入射させ、ホログラムを作製した。ここで用いたレーザ光は発振波長５２８ｎｍのＡｒレーザによるものである。

【００１４】本実施例では粒径９．５μｍの研磨材で光拡散性ガラス１４を研磨した場合、視野角が４０°だった。これに対し、粒径２０μｍの研磨材で同じく光拡散性ガラス１４を研磨した場合、視野角は７０°になった。さらに、ガラス両面を研磨すると光拡散性はさらに大きくなり視野角を拡げることができ、粒径２０μｍで両面を研磨すると９０°に拡がった。このように、光拡散性ガラスの粗さを設定することによって、対応する視野角に設定されたホログラムを作製することができる。

【００１５】本実施の形態では光拡散性ガラスを所定の粒径を有する研磨材で研磨することによって、光拡散性を生成しているが、この他の材料として、アクリル、ポリカーボネートなどの透明樹脂板やＰＥＴ等の透明フィルムが挙げられる。そして、これらの表面粗さの加工法としては、研磨剤による研磨加工以外に、サンドブラスト加工やエッチング処理でも行える。また、これらの材料に複屈折性がないことがホログラム作製上、レーザ光の偏光面を保持するために好ましい。

【００１６】ホログラムは、通常は数十ｍｍ角～数百ｍｍ角程度の面積で、数μｍ～数十μｍ程度の厚みであり、光回折機能を持つもので、その他ホログラムと呼ばれるものを広く用いることができ、リップマンタイプ等の体積・位相型のホログラムが高い回折効率を得られるという点で望ましい。

【００１７】かかるホログラムは車外側から明るい表示が見えるような高反射率を実現でき、車内からの視認性を損なわず、車両用窓ガラスの曲面形状に追従する必要があることから本発明の実施例で用いたようなフォトポリマーが好ましい。本実施例で用いたホログラムは単色のホログラムであるが、性質の異なる光で多重露光を施して形成したり、異なる光で露光した複数のホログラムを重ねて多色の表示とすることもできる。なお、ホログラムの仕様はこれらに制限されるものではなく、貼り付けるホログラムの部位、位置により種々の変更が可能である。

【００１８】

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【発明の効果】以上のように、ホログラム作製後の所定の視野角に対応している所定粗さの少なくとも１枚の光学拡散板を使用して、ホログラム作製時にホログラムの視野角調整を行うようにしたので、光拡散性板の粗さを設定することによって、対応する視野角に設定されたホログラムを作製し、ホログラムに記録されたパターンの見える所望の視野角を確保した車両用窓ガラスの装飾が可能となる。

【図面の簡単な説明】

【図１】本発明に関わる実施の形態のホログラムの視野角調整方法によるホログラム作製法を示す概略図である。

【図２】図１により作製されたホログラムの回折状態を示す概略図である。

【図３】図１により作製されたホログラムの実際の使用形態を示した概略図である。

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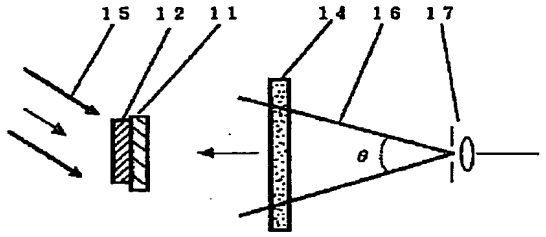
【図４】図１により作製されたホログラムの実際の他の使用形態を示した概略図である。

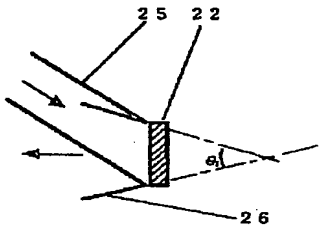
【符号の説明】

１１　透明基板ガラス
１２　ホログラム感光材料
１４　光拡散性ガラス
１５　第１レーザ光
１６　第２レーザ光
２２　ホログラム
２５　外光
２６　回折光
３１，４１　窓ガラス
３２，４２　ホログラム
３３，４３　保護層
３４，３５，４４，４５　接着層

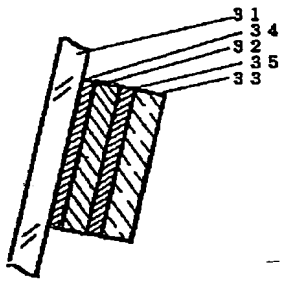
【図１】



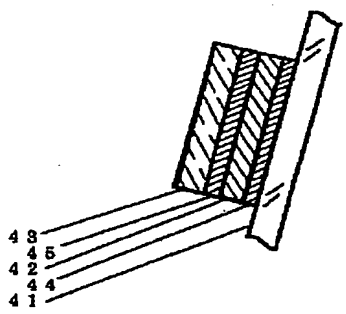
【図２】



【図３】



【図４】



PATENT ABSTRACTS OF JAPAN

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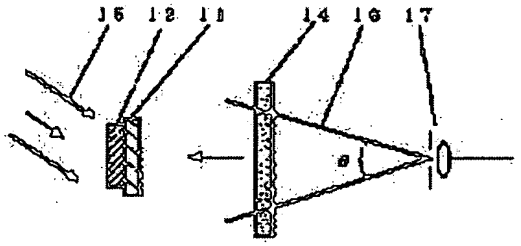
(54) METHOD OF ADJUSTING ANGLE OF VISIBILITY OF HOLOGRAM

(57)Abstract:

PROBLEM TO BE SOLVED: To maintain a desired angle of visibility to see a pattern recorded in a hologram by using at least one optical diffusing sheet having specified roughness corresponding to the specified angle of visibility after the production of the hologram so as to control the angle of visibility of the hologram in the production of the hologram.

SOLUTION: A hologram photosensitive material 12 is adhered to a transparent substrate glass 11. The hologram photosensitive material 12 is irradiated with second laser light 16 having a controlled diffusion state from the transparent substrate glass 11 side through a light diffusing glass 14 as a light diffusing plate, while first laser light 15 is made to irradiate in the same plane as for the second laser light 16 through the rear side to the irradiation side of the second laser light to produce a hologram. The second laser light 16 is transformed into spherical diverging light at a diverging angle θ by a spatial filter 17 and transmits through the light diffusing glass 14. The light diffusing glass 14 is controlled to have specified surface roughness so that it gives proper diffusion to the light with diverging angle θ and to allow the laser light to enter the hologram photosensitive material 12.



LEGAL STATUS

[Date of request for examination]

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[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

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[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The angle-of-visibility adjustment approach of the hologram which is the angle-of-visibility adjustment approach of the hologram which sets up the include angle which can check the reconstruction image of a hologram by looking, irradiates a coherent light at hologram sensitive material, and is characterized by irradiating hologram sensitive material and setting up a predetermined angle of visibility by making said coherent light into the diffused light with at least one optical diffusion plate of predetermined granularity corresponding to the predetermined angle of visibility after hologram production.
[Claim 2] The angle-of-visibility adjustment approach of the hologram according to claim 1 which sets surface roughness of said optical diffusion plate to 4 micrometers - 60 micrometers, and sets a corresponding angle of visibility as 30-100 degrees.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the angle-of-visibility adjustment approach of a hologram used for the emblem which can ask for the size of the include angle which can check the pattern of a hologram by looking especially about the angle-of-visibility adjustment approach of a hologram.
[0002]
[Description of the Prior Art] Using a hologram for the ornament for cars in recent years is proposed. In such a case, the light which carried out incidence from the predetermined direction diffracts a hologram, and it makes an observer check this diffracted light by looking. And an observer recognizes this pattern by recording a pattern etc. on a hologram beforehand. An observer can be made to check a new image by looking according to the condition of such light by producing the hologram which diffracts the light (for example, light from sunlight or other vehicles) from the outside of a vehicle. As an ornament of the windowpane for cars, when it sticks on a windowpane, an ornament a pattern appears from a vehicle outside by the hologram on which the pattern designed by arbitration was recorded is made with the light from the outside of a vehicle, or in the car.
[0003]
[Problem(s) to be Solved by the Invention] Here, the hologram has wavelength selectivity depending on the conditions at the time of production, only the light of a specific wavelength region will be diffracted, and the light of other wavelength will penetrate a hologram. Therefore, the direction of the light diffracted from a certain direction to the outdoor daylight which carries out incidence is decided uniquely, and serves as the diffracted light of the narrow include-angle range. Consequently, as mentioned above, when using a hologram for the pattern of the ornament for cars, the include-angle field (angle of visibility) where the observer outside a vehicle can check this pattern by looking will be restricted, and that a pattern is checked by looking has the problem of becoming only a specific direction. Then, although the configuration of carrying out the laminating of two or more holograms from which the direction which is in sight differs in piles is proposed in order to extend the range the pattern recorded on the hologram appears, it has problems, such as decline in the foreign body sensation by duplication of a laminating process, and the increment in thickness, and light permeability, and a cost rise.
[0004] The object of this invention is solving the above-mentioned technical problem, and is offering the angle-of-visibility adjustment approach of the hologram which can set up beforehand the include-angle range the pattern recorded on the hologram appears.
[0005]
[Means for Solving the Problem] It is the angle-of-visibility adjustment approach of the hologram which this invention is made that the above-mentioned technical problem should be solved, and sets up the include angle which can check the reconstruction image of a hologram by looking. Irradiate a coherent light at hologram sensitive material, and hologram sensitive material is irradiated by making said coherent light into the diffused light with at least one optical diffusion plate of predetermined granularity corresponding to the predetermined angle of visibility after hologram production. The angle-of-visibility adjustment approach of the hologram characterized by setting up a predetermined angle of visibility is offered. The angle-of-visibility adjustment approach of the above-mentioned hologram which sets surface roughness of the above-mentioned optical diffusion plate to 4 micrometers - 60 micrometers, and sets a corresponding angle of visibility as 30-100 degrees is offered.
[0006]
[Embodiment of the Invention] Hereafter, the gestalt of operation is explained. Drawing 1 is the schematic diagram showing the hologram producing method by the angle-of-visibility adjustment approach of the hologram of the gestalt the operation in connection with this invention. The hologram sensitive material 12 is stuck on transparence substrate glass 11. The 2nd laser beam 16 to which the optical diffusibility glass 14 as an optical diffusion plate was penetrated from the 11th page side of transparence substrate glass, and the diffusion condition was adjusted is irradiated to the hologram sensitive material 12, incidence of the 1st laser beam 15 within the same field as the 2nd laser beam 16 is carried out from the rear-face side by the side of this exposure, and a hologram is produced.
[0007] Here, the 2nd laser beam 16 is changed into spherical-surface divergence light by the spatial filter 17 at the divergence include angle theta. And optical diffusibility glass 14 is penetrated. Surface roughness is set as the predetermined numeric value, and this optical diffusibility glass 14 gives moderate dispersion to the divergence include angle theta by the spatial filter 17, and carries out incidence of the laser to the hologram sensitive material 12. Although this optical diffusibility glass demonstrates at least one sufficient validity, it can also be used two or more sheets. In that case, surface roughness can also be changed into each. In addition, the coating layer which prevents scattered reflection may be prepared in transparence substrate glass 11.
[0008] Drawing 2 is the schematic diagram showing the diffraction condition of the hologram produced by drawing 1 . As shown in this drawing, if outdoor daylight 25 is irradiated from the same direction as the laser light 15 of drawing 1 , the diffracted light 26 will diffuse only the diffraction divergence include angle theta 1, and it will be reproduced to the hologram 22 produced by the optical system of drawing 1 . This diffraction divergence include angle theta 1 is equivalent to an angle of visibility. And this diffraction divergence include angle theta 1 becomes large as a result by enlarging the divergence include angle theta like the publication about drawing 1 by the activity of the optical diffusibility glass 14 at the time of hologram production. That is, an angle of visibility spreads. Then, in the hologram making process shown in drawing 1 , predetermined granularity can be given to optical diffusibility glass 14, dispersion which corresponds by this can be given to the 2nd laser beam 16, and the predetermined angle of visibility corresponding to this predetermined granularity can be given to a hologram.
[0009] When using the glass which ground the front face with abrasives as this light diffusing glass, by making particle size of abrasives coarse moderately, the divergence include angle theta becomes large and an angle of visibility spreads. Or a corresponding,

predetermined angle of visibility can also be obtained by polish by predetermined abrasives particle size. In this case, as a determinant of the predetermined numeric value of surface roughness, there is particle size of abrasives, and as a concrete numeric value, 4 micrometers - 60 micrometers are suitable, and is 10 micrometers - 40 micrometers preferably. If particle size is set to 4 micrometers - 60 micrometers, a corresponding angle of visibility will become 30 degrees or less. Here, when particle size is 4 micrometers or less, diffusibility will not be acquired but light will penetrate almost, it becomes mirror finish, it is unsuitable, and in the case of 60 micrometers or more, since the granularity on the front face of light diffusing glass is large, diffusibility falls, and it becomes uneven and becomes too unsuitable.

[0010] Next, drawing 3 is the schematic diagram having shown the actual activity gestalt of the hologram produced by drawing 1 . The hologram produced with the hologram making process shown in drawing 1 was stuck through the acrylic adhesive layer 44 inside [vehicle] the windowpane 41 of a car, and the laminating of the protective layer 33 by the polyethylene terephthalate (PET) by which rebound ace court processing was carried out through the acrylic adhesive layer 35 was carried out to another field of a hologram 42.

[0011] Although it is an adhesive layer, or a glue line / hologram / glue line / protective layer as this configuration, a hologram/protective layer is sufficient at an adhesive layer or a glue line / hologram / protective layer, and a pan. Moreover, drawing 4 is the schematic diagram having shown other activity gestalten with the actual hologram produced by drawing 1 . As shown in this drawing, it can also stick on the vehicle outside of a windowpane 41 according to the direction of a laminating. In this case, the hologram 42 was stuck through the acrylic adhesive layer 44, and carried out the laminating of the protective layer 43 by the polyethylene terephthalate (PET) by which rebound ace court processing was carried out through the acrylic adhesive layer 45 to another field of this hologram 42. A hologram is a reflective mold hologram of the volume and phase mold of the lip man type which consists of 20 micrometers in thickness, 80mm long, and an acrylic 120mm wide photopolymer.

[0012] When carrying out a laminating to the vehicle inner surface of a windowpane in view of the point of protection from the ultraviolet-rays component of sunrays here, it is desirable to mix an ultraviolet absorption component in the adhesive layer or glue line for sticking on glass. It is so good that it is close to the glass laminate used for a windshield from the point of protection in a veneer glass part as ultraviolet absorption engine performance, and although it is effective when cut to 50% or less near 380nm, 20% or less is desirable. Furthermore, about the protective layer prepared in view of the point of protection from an external factor, an adhesive layer or a glue line may be minded between a protective layer and a hologram. When carrying out the laminating of the hologram to the vehicle outside surface of a windowpane, it is desirable to mix an ultraviolet absorption component in a protective layer or a protective layer, the adhesive layer between holograms, or a glue line in view of the point of protection from the ultraviolet-rays component of sunrays.

[0013] (Example 1) The example of the hologram hereafter produced with the hologram making process shown in drawing 1 is explained. The hologram sensitive material 12 is stuck on transparence substrate glass 11. The 2nd laser beam 16 penetrates the optical diffusibility glass 14 installed in a location with a distance [from transparence substrate glass 11] of 300mm, and a diffusion condition is adjusted. And to the normal of the transparence substrate glass 11 side to a substrate, the 2nd laser beam 16 to which this diffusion condition was adjusted is 10 degrees in include angle, and irradiates the hologram sensitive material 12. Incidence of the 1st laser beam 15 was carried out from the rear-face side by the side of this exposure from the 50-degree direction to the hologram sensitive material 12 to the normal in the same field as the 2nd laser beam 16, and the hologram was produced. The laser beam used here is based on Ar laser with an oscillation wavelength of 528nm.

[0014] In this example, when optical diffusibility glass 14 was ground with abrasives with a particle size of 9.5 micrometers, the angle of visibility was 40 degrees. On the other hand, when optical diffusibility glass 14 was similarly ground with abrasives with a particle size of 20 micrometers, the angle of visibility became 70 degrees. Furthermore, when glass both sides were ground, optical diffusibility became still larger and the angle of visibility could be extended, and when both sides were ground with the particle size of 20 micrometers, it spread at 90 degrees. Thus, the hologram set as the corresponding angle of visibility is producible by setting up the granularity of optical diffusibility glass.

[0015] Although optical diffusibility is generated with the gestalt of this operation by grinding optical diffusibility glass with the abrasives which have a predetermined particle size, bright films, such as transparence resin plates, such as an acrylic and a polycarbonate, and PET, are mentioned as other ingredients. And as a method of processing such surface roughness, sandblasting processing and etching processing can also be performed in addition to polish processing by the abrasive material. Moreover, it is desirable in order that that there is no birefringence in these ingredients may hold the plane of polarization of a laser beam on hologram production.

[0016] It is usually the area of hundreds of dozens of mm angle - mm angle extent, and a hologram is several micrometers - about dozens of micrometers in thickness, and is desirable at the point that it can have an optical diffraction function, what is called a hologram can be used widely, and the hologram of the volume and phase molds, such as a lip man type, can acquire high diffraction efficiency.

[0017] Since this hologram can realize a high reflection factor a bright display is in sight from a vehicle outside, and does not need to spoil the visibility from in the car but needs to follow the curved-surface configuration of the windowpane for cars, its photopolymer which was used in the example of this invention is desirable. Although the hologram used by this example is a monochromatic hologram, with the light from which a property differs, it can give and form multiplex exposure or can also consider in piles two or more holograms exposed with a different light as a multicolor display. In addition, various modification is possible for the specification of a hologram by the part of the hologram which it is not restricted to these and stuck, and the location.

[0018]

[Effect of the Invention] As mentioned above, since at least one optical diffusion plate of predetermined granularity corresponding to the predetermined angle of visibility after hologram production is used and it was made to perform angle-of-visibility adjustment of a hologram at the time of hologram production By setting up the granularity of an optical diffusibility plate, the hologram set as the corresponding angle of visibility is produced, and the ornament of the windowpane for cars which secured the angle of visibility of the request the pattern recorded on the hologram appears is attained.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the schematic diagram showing the hologram producing method by the angle-of-visibility adjustment approach of the hologram of the gestalt the operation in connection with this invention.
[Drawing 2] It is the schematic diagram showing the diffraction condition of the hologram produced by drawing 1 .
[Drawing 3] It is the schematic diagram having shown the actual activity gestalt of the hologram produced by drawing 1 .
[Drawing 4] It is the schematic diagram having shown other activity gestalten with the actual hologram produced by drawing 1 .
[Description of Notations]
11 Transparence Substrate Glass
12 Hologram Sensitive Material
14 Optical Diffusibility Glass
15 1st Laser Beam
16 2nd Laser Beam
22 Hologram
25 Outdoor Daylight
26 Diffracted Light
31 41 Windowpane
32 42 Hologram
33 43 Protective layer
34, 35, 44, 45 Glue line

[Translation done.]

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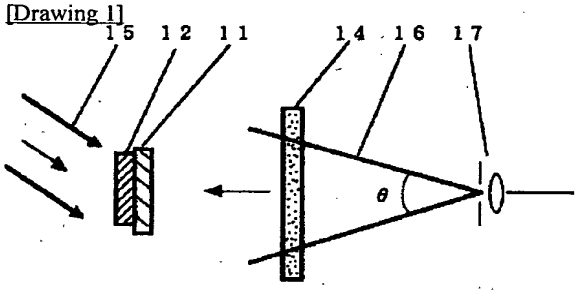
DRAWINGS

[Drawing 1]



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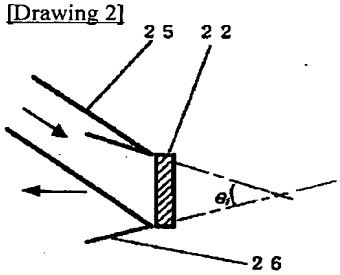
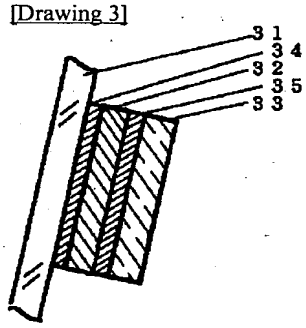
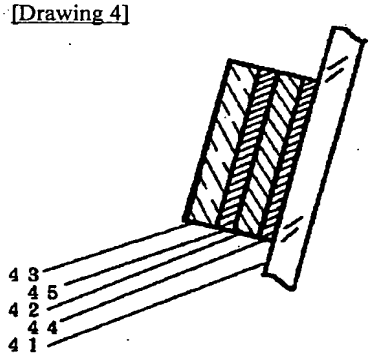


[Drawing 3]



[Drawing 4]



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